soluble, unlike the water-insoluble salts proposed in Meade. The applicants' specification disclosed that the hydroxy analog of methionine is soluble and therefore pass through the rumen at the equivalent rate of chromium, the liquid marker (Page 13, Line 27). An important aspect of applicants' invention is not that hydroxy analog of methionine can be used as a methionine feed supplement, but rather that it can be used to supplement methionine dietary requirements without requiring protective coatings, bypass fat, or other protective ingredients to prevent its degradation in the rumen with predictable benefits. While Meade indicates that the water-insoluble salts of methionine are not undesirably altered or degraded in the rumen and presumably 100% available for absorption, the applicants have determined that at least 20%, preferably 40% or greater, and most preferably 40-55%, of the hydroxy analog of methionine is not degraded by the rumen and is thereby available for absorption by the ruminant. Having identified the percentage of availability of hydroxy analog of methionine, the applicants have enabled those skilled in the art to accurately quantify the ultimate level of addition of hydroxy analog of methionine to match the methionine needs of the ruminant when formulating ruminant food rations.

Additionally, Meade does not suggest to one skilled in the art that water soluble hydroxy analog of methionine could be substituted for the disclosed water-insoluble calcium or magnesium salt of methionine and achieve the same or similar results. Instead, Meade suggests that the water-soluble hydroxy analog of methionine could not be substituted for the water-insoluble calcium or magnesium salt of methionine as it does not possess the same property of avoiding or minimizing degradation in the rumen. Thus, Meade does not suggest to one skilled in the art that the hydroxy analog of methionine could be added as an amino acid feed supplement in doses similar to water-insoluble calcium or magnesium salts of methionine that are selected according to well known nutritional criteria. Therefore, the Meade reference does not substantially disclose the applicants' invention as claimed.

While the Nocek et al. may disclose a method of formulating dairy cow rations based upon the amounts of ruminally available proteins (RAP) and carbohydrates (RAC) in the feedstuffs comprising the total daily rations, the feedstuffs repeatedly described in the reference consisted of mixtures of grain and forages (e.g. Determination of RAP and RAC

Values, Column 3, lines 56-58; Microbial Synthesis Study, Column 6, Lines 58-59; Controlled Lactation Studies, Column 7, Lines 30-37; Field Demonstration Trial, Column 9, Lines 35-38, Column 10, Lines 37-40; and Claims 1(d), 2, and 3). Nocek et al. disclose that an optimum lactation response is obtained from a total daily ration containing RAP and RAC in the ranges of about 10.5-12.5% and 35%-45% respectively (Column 7, Lines 40-43).

While Nocek et al. discuss determining the RAP and RAC of solid grain mixtures and forages, they do not disclose or suggest how to quantify the level of water-soluble hydroxy analog of methionine or other types of individual amino acid feed supplements that are not degraded in the rumen. The RAP and RAC levels were obtained with conventional chemical analysis and in situ techniques. Ground grain and by-product feed samples were placed in porous polyester bags that were then inserted into the rumen via a plexiglass cannula. After specified incubation times, the bags were removed, then rinsed twice and dried. The RAP and RAC values were determined from the residual dry matter.

The analysis methods used to determine RAP and RAC values from solid grain mixtures and forages would be inappropriate for determining the level of hydroxy analog of methionine that is not degraded in the rumen. As previously discussed, the hydroxy analog of methionine is water-soluble. If the Nocek et al. method were employed to determine the level of hydroxy analog of methionine that is not degraded in rumen, the water-soluble hydroxy analog of methionine would likely be in solution form shortly after the porous bag is inserted into the rumen. Even if some residual level of hydroxy analog of methionine remained on the solid material in the bag, it too would be lost as soon as the bag was rinsed twice with water prior to drying. Therefore, the Nocek et al. reference does not teach a method by which one skilled in the art could determine the level of hydroxy analog of methionine that is available for absorption by the ruminant.

Nocek et al. can further be distinguished as a reference that teaches how one can determine the ranges of ruminally available proteins and carbohydrates in total daily rations to optimally produce milk. The reference does not discuss or suggest ensuring a ruminant receives any particular amino acid within its diet to promote milk production or how to determine the percentage amino acid supplements that bypass the rumen. Since proteins are

made up of a variety of amino acids in varying quantities and the proteins are some of the raw materials from which methionine is obtained in the ruminant, determining the percentage of RAP does not also identify the methionine requirements to achieve optimal milk production. In addition, even if a shortage of methionine was identified, since hydroxy analog of methionine is degraded to some extent in the rumen, one would have to first know the percentage of methionine that bypasses the rumen before formulating a feed ration to make up the methionine shortage. Therefore, any shortfall of RAP from the optimum percentage cannot simply be "made up" by adding a corresponding amount of hydroxy analog of methionine to the ruminant's food ration.

The teachings of the Meade and the Nocek et al. references, when used in combination, do not describe the applicants' invention, nor do their teachings make the applicants' invention obvious. If one skilled in the art were to follow Nocek et al. to formulate a ruminant food ration, a RAP and RAC value could be identified for a given forage and grain component of the ration. As described above, however, if the RAP was not at a concentration to result an optimum milk production, the difference could not simply be made up by a corresponding supplement of a hydroxy analog of methionine. Additionally, as previously described, the water-insoluble calcium or magnesium salt of methionine compounds disclosed in the Meade reference differ from the hydroxy analog of methionine in that they pass through the rumen without undesirable alteration or degradation. Therefore, all of the water-insoluble calcium or magnesium salt of methionine supplied would be available for absorption. Conversely, only 20%, preferably 40% or greater, and most preferably 40-55%, of the hydroxy analog of methionine supplement would be available for absorption. Thus, even if Nocek et al. or a similar model were to specifically identify a shortfall of methionine in a ruminant's diet, one could not simply use the teachings of Meade to add a corresponding quantity of a hydroxy analog of methionine until one learned that at least 20%, preferably 40% or greater, and most preferably 40-55%, of such supplements are not degraded by the rumen. Furthermore, the Nocek et al. reference, if combined with a reference such as U.S. Patent No. 4,388,327 that discloses the use of hydroxy analog of methionine as a ruminant feed supplement, would not describe the applicants' invention or make their

invention obvious. Therefore, the combination of the Meade and the Nocek et al. references do not describe the applicants' invention or make the invention obvious. Accordingly, claim 1 is submitted as patentable over the art relied on by the Examiner.

In summary, hydroxy analog of methionine bypasses the rumen in sufficiently high quantities to be used as a feed supplement without protective coatings, or separate from or in the absence of bypass fat in ruminant food rations. The applicants have discovered that by determining the percentage of the hydroxy analog of methionine that bypass the rumen, feeds can be formulated to advantageously provide a ruminant with a low cost, enabling supply of methionine to optimally produce milk. A further advantage of this invention is that by matching the concentration of the hydroxy analog of methionine with the methionine requirements of the ruminant, the formulated feed does not burden the ruminant with processing and eliminating excess amino acids.

Claims 2 to 5 depend from claim 1 and are patentable for the same reasons as those set forth above for claim 1 and by reason of the further requirements which they specify.

B. Claims 6 - 7

Claim 6 is directed to a process for formulating a ruminant food ration. The process comprises determining the methionine needs of the ruminant, identifying feed ingredients and the nutrient composition of such ingredients wherein one of the ingredients is a hydroxy analog of methionine, and formulating a ration from the identified feed ingredients to meet the determined methionine needs of the ruminant wherein one or more grains are mixed with a liquid comprising 2-hydroxy-4-(methylthio)butanoic acid wherein the ration is formulated on the basis that at least 20% of 2-hydroxy-4-(methylthio)butanoic acid is assumed to be available for absorption by the ruminant.

Claim 6 is similar to claim1 except that the specified form of hydroxy analog of methionine is 2-hydroxy-4-(methylthio)butanoic acid in a liquid. For the reasons already presented in the analysis traversing the rejection to claim 1, the applicants accordingly submit that claim 6 is patentable over the art relied on by the Examiner.

Claims 7 depends from claim 6 and is patentable for the same reasons as those set forth above for claim 6 and by reason of the further requirements which they specify.

C. Claims 8 - 10

Claim 8 is directed to a process for formulating a ruminant food ration. The process comprises determining the methionine needs of the ruminant, identifying feed ingredients and the nutrient composition of such ingredients wherein one of the ingredients is a hydroxy analog of methionine, and formulating a ration from the identified feed ingredients to meet the determined methionine needs of the ruminant wherein (i) the ration is formulated on the basis that at least 20% of the hydroxy analog of methionine is assumed to be available for absorption by the ruminant, and (ii) the ration does not comprise a bypass fat.

Claim 8 is similar to claim 1 except that the ration does not contain a bypass fat. For the reasons already presented in the analysis traversing the rejection to claim 1, the accordingly submits that claim 8 is patentable over the art relied on by the Examiner.

Claims 9 and 10 depend from claim 8 and are patentable for the same reasons as those set forth above for claim 8 and by reason of the further requirements which they specify.

D. Claim 11

Claim 11 is directed to a process for formulating a lactating dairy cow food ration. The process comprises determining the methionine needs of the ruminant, identifying feed ingredients and the nutrient composition of such ingredients wherein one of the ingredients is 2-hydroxy-4-(methylthio)butanoic acid, and formulating a ration from the identified feed ingredients to meet the determined methionine needs of the ruminant wherein the ration is formulated on the basis that at least 40% of the hydroxy analog of methionine is assumed to be available for absorption by the ruminant.

Claim 11 is similar to claim 1 except that the food ration is for a lactating dairy cow instead of a generic ruminant, the claim does not contain a bypass fat limitation, and at least 40%, instead of 20%, of the hydroxy analog of methionine is assumed to be available for

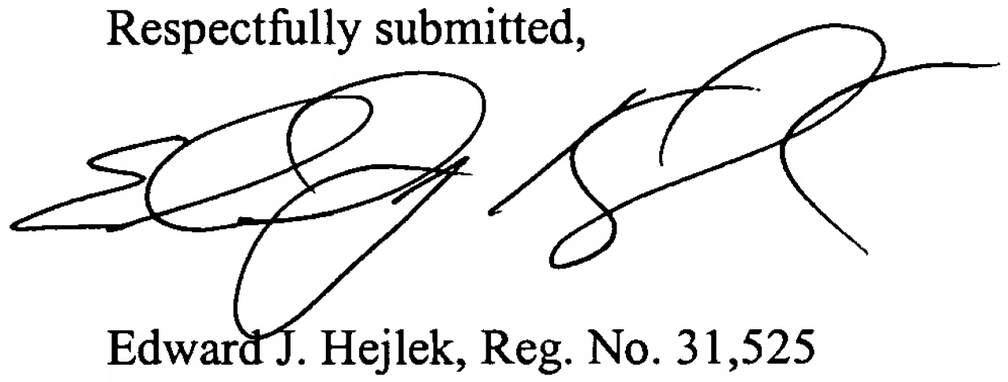
absorption. For the reasons already presented in the analysis traversing the rejection to claim 1, the applicants accordingly submit that claim 11 is patentable over the art relied on by the Examiner.

In view of the foregoing, applicants submit that the claims of the present application are patentable over the cited art. Favorable reconsideration and allowance of all of the pending claims is respectfully requested.

A check for $110.00 is attached to cover the fee for a one month extension of time up to and including today's date. Any other charges or overpayment should be applied to deposit account 19-1345.

Filed concurrently is a second Power of Attorney in the above-referenced application executed by two inventors that had not previously granted a Power of Attorney for this application. A Declaration and Power of Attorney by the remaining three inventors was sent to the Patent Office on June 10, 1998. The two Powers of Attorney grant the registered attorneys designated therein the authority to prosecute this application and to transact all business connected therewith for all of the inventors of the application.

Respectfully submitted,



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CERTIFICATE OF MAILING

I certify that the foregoing AMENDMENT A, in the application of Christopher D. Knight, Serial No. 08/900,414, filed July 25, 1997, is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on this 22nd day of January 1999.

Jonell Layton